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NOVEMBER 1972, No. 11

FISHING INFORMATION

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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MARINE
FISHERIES
SERVICE

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CENTER
LA JOLLA,
ALIFORNIA

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE - P. O. BOX 271
LA JOLLA, CALIFORNIA 92037

FISHING INFORMATION

NOVEMBER 1972, No. 11

B. J. Rothschild, Director, SOUTHWEST FISHERIES CENTER
I. Barrett, Deputy Director
F. Hester, Director, Honolulu Laboratory

PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, including the Tuna Newsletter, 2) sections of subsurface temperature structure for parts of the North Pacific, 3) a narrative description of pertinent temperature conditions, 4) charts of winds and pressures for the eastern North Pacific, and 5) charts of sea surface temperature for the North Pacific and eastern tropical Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. This is a chart of sea surface temperature (contoured at 2°F intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

R. Michael Laurs, Leader
Fishery-Oceanography Investigations
Southwest Fisheries Center
La Jolla, California

Submitted for publication - December 14, 1972

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ENVIRONMENTAL CHARTS PREPARED BY:

L. Eber (Figure 4), F. Miller (Figures 7, 8, and 9)
J. Renner (Figures 1, 2, 3, 5, and 6), J.F.T. Saur (Figure 10)

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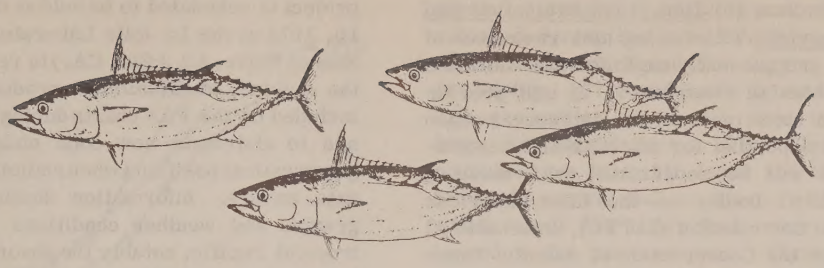
Expendable bathythermograph observations are made by the Mates of the S.S. Chevron California of Chevron Shipping Co., and processed with assistance from the NMFS Pacific Environmental Group, Monterey: Project partially supported by National Science Foundation Grant AG-256.



TUNA NEWSLETTER

editor— L. Vlymen

TO OUR READERS

With this and subsequent issues of the Tuna Newsletter we hope to bring to our readers current results of research on tuna underway at the National Marine Fisheries Southwest Fisheries Center's two laboratories in La Jolla, California and Honolulu, Hawaii. Included also will be information on advances in marine technology made by other nations or in other fisheries that may have application in the U.S. industry, abstracts of important papers on tuna by foreign authors, summarized data on tuna catch information from U.S. and French fleets. Our objective in turning out this Newsletter is to improve the flow of research information from the scientific community to the tuna industry.

Your comments and suggestions for improvements will be most welcome and should be sent to the Director, NMFS Southwest Fisheries Center, P.O. Box 271, La Jolla, CA. 92037.

GLOBAL TUNA STUDIES PLAN PRESENTED TO U.S. DELEGATION AT PANAMA MEETINGS

Dr. Brian J. Rothschild, Director of SWFC, presented copies of a proposal: Global Tuna Studies--A National Program, to members of the U.S. delegation attending the Inter-Governmental Tuna Meetings in Panama, November 6-10. In introducing this document, Dr. Rothschild explained that although existing NMFS projects on U.S. tuna research are conducted in several laboratories, most of this research is now being carried out by the SWFC where there is a wide variety of tuna or tuna-related studies ranging from mercury feeding experiments to population dynamics. The Global Tuna Studies program is an attempt to integrate U.S. government tuna research involving the scientific and economic studies of the commercial/sport fisheries and to accelerate the application of advanced technology in computer processing of data of stock assessment and innovative quantitative methodology in general and of fisheries management science to tuna management. Global Tuna Studies is proposed as a U.S. national program on the tunas and will include such activities as (1) Tuna Extension Services. This service will work closely with the national program and provide various services specifically to the tuna fishing community. Its primary functions will be to serve as a communications link between the sectors of the tuna industry and the scientific community and to act as a catalyst for joint participation in innovation. (2) Tuna Information Services will be expanded from oceanographic-meteorological to include stock and fishery data. It will have the task of developing software and hardware systems for collecting, processing and storing, with easy retrieval and real-time display, environmental, fisheries,

and other data required to support other components of Global Tuna Studies. (3) Tuna Stock Evaluation and Exploration Services will catalog tuna resources of the world that are presently exploited and those that are underexploited or unexploited. It will provide information on stock productivity and conservation measures and expertise for international negotiations. Studies will be coordinated with those of such international bodies as the Inter-American Tropical Tuna Commission (IATTC), International Commission for the Conservation of Atlantic Tunas (ICCAT), etc., of which the U.S.A. is a member. (4) The Tuna Impact Advisory Services will be responsible for creating fisheries models which integrate the stocks, fishing effort, ocean-fish interactions, economics, sociology, politics, technology and other factors that have a bearing on a global tuna system. The ultimate objectives of the models are to evaluate the impact of alternative strategies for harvesting and conservation measures.

According to Dr. Rothschild, when and if the Global Tuna Studies Program is fully implemented, it will provide the tuna industry and the scientific communities better channels of communication, both from government to industry and from industry to government.

EXCELLENT COOPERATION RECEIVED FROM TUNA FISHERMEN PARTICIPATING IN THE FAX PROJECT

Dr. R. Michael Laurs, Leader of the Fishery-Oceanography Investigations, reports that excellent cooperation was received from tuna fishermen participating in the radio facsimile (FAX) fishery advisory project at the La Jolla Laboratory during the 1972 tropical tuna fishing season. The cooperating purse seiners radioed ashore a total of 2,648 observations, 498 expendable bathythermograph (XBT) and 2,150 synoptic marine weather observations, a highly significant increase in the number of observations from the eastern tropical Pacific. The environmental data collected by fishermen are necessary for use in the development of fishery-prediction methods underway by this group, and are shared with the U.S. Navy, which is providing XBT-BATHY probes, some BATHY equipment and certain other operational support, and with the National Weather Service. The fishermen are making and radioing ashore environmental observations in return for use of FAX recording equipment provided by the La Jolla Laboratory.

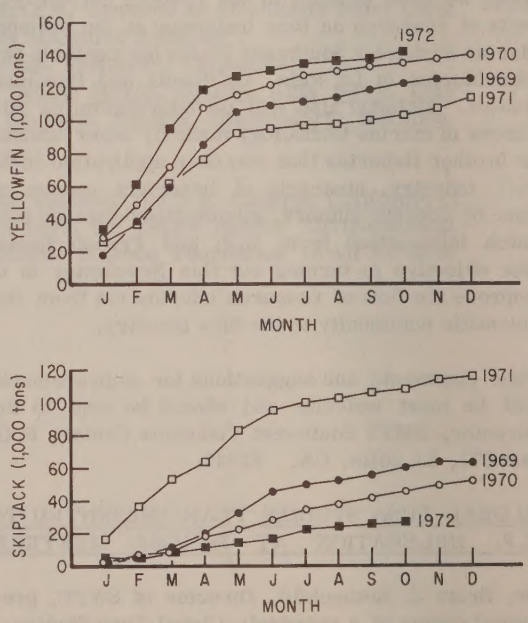
A total of 52 purse seiners participated in the program during 1972 and additional requests from boats for FAX equipment will be filled as soon as NMFS can obtain the needed equipment.

A meeting of fishermen cooperating in the FAX project is scheduled to be held at 0900 on December 19, 1972 at the La Jolla Laboratory (8604 La Jolla Shores Drive, La Jolla, CA.) to review and evaluate the service, to explain new products planned to be included on the FAX charts during the 1972 season, and to distribute new code charts for encoding geographical positions when radioing environmental data ashore. Information dealing with oceanographic and weather conditions for the eastern tropical Pacific, notably the abnormally high ocean temperature conditions and the effects on fishing will also be discussed.

SKIPJACK TUNA CATCH IN HAWAIIAN FISHERY REMAINS SLIGHTLY ABOVE LONG-TERM AVERAGE

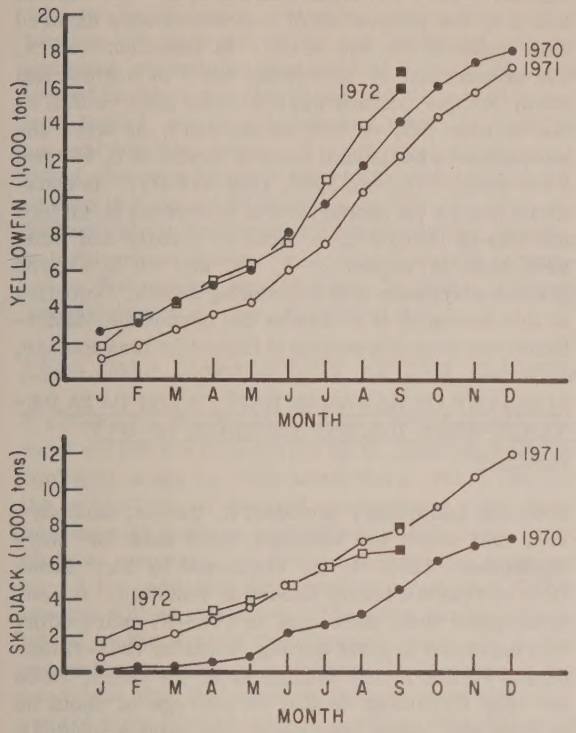
The October catch of skipjack tuna in the Hawaiian fishery reached an estimated 320 t (metric tons), 53 t below the catch in October 1971 and 37 t greater than the October average for 1948-71. The catch from January through October was estimated at 4,418 t, 1,238 t below last year's catch for the same period and 268 t above the long-term average.

TUNA CATCH BY INTERNATIONAL FLEET



Catch of yellowfin and skipjack fleet by international fleet that fishes in the eastern tropical Pacific as reported by IATTC

FRENCH AND SENEGALESE TUNA CATCH



Catch of yellowfin and skipjack tuna by a company of French and Senegalese baitboats and purse seiners which fish mainly off Africa. In 1972, however, several vessels fished in the Caribbean and not all of their catches reported. The spread between the solid squares presumably reflects the Caribbean catch figures. Catches by this company represented approximately 70% of French and French-African catches.

EXPERIMENTS CONTINUED ON RATE OF BODY TEMPERATURE CHANGE IN SKIPJACK

Dr. W. Neill and R. Chang are continuing experiments at the Honolulu Laboratory on the rate of body temperature change in skipjack. Temperature preferences and the effect of temperature on behavioral and physiological functions may play a major role in skipjack distribution. Results will enable estimation of body temperatures of fish encountering any sequence of environmental temperatures and provide insight into a possible thermoregulatory mechanism in tunas.

SEVENTY FIVE TAGGED ALBACORE RECOVERED DURING 1972 ALBACORE FISHERY

Seventy five tagged albacore have been recovered during 1972 (up to October 31) in the U.S. albacore fishery and one in the Japanese livebait fishery off Japan. A total of 2,842 albacore was tagged and released during the joint NMFS-American Fishermen's Research Foundation tagging project -- 891 in October, 1971, and 1,951 in early season 1972. Ten recoveries made this year have been made from fish tagged during 1971. One of these recoveries was from off Japan and the others were from off central and southern California, mostly within about 150 miles from where the fish were tagged in the previous year. There have been 65 recoveries of fish tagged this season. The results indicate that 1) fish tagged in June, 800-1100 miles offshore, apparently followed more than one migration route into coastal waters, 2) fish tagged in July outside and north of the Channel Islands moved to the north, but that fish tagged off northern Baja California moved in random directions and nearly all were caught within about 75 miles of where they were tagged after being at liberty up to 2 months, and 3) fish tagged in August off northern Baja California moved to the north. A summary of the preliminary results from the joint NMFS-AFRF tagging project was presented at the 23rd Tuna Conference at Lake Arrowhead, California, October 16-18, 1972.

* * * * * * * *

Total west coast albacore landings for the 1972 season are estimated at approximately 33,000 tons. This is the best catch since 1950 when about 36,000 tons were landed, and is the second highest on record. Because of decreasing fishing effort and catches, the daily albacore broadcast and bi-weekly albacore fish bulletin issued from the La Jolla Laboratory were terminated on October 16, 1972.

DISCRIMINATION OF TEMPERATURE DIFFERENCES BY KAWAKAWA CONTINUED

An experiment was continued at Kewalo Basin in Honolulu to determine what temperature differences can be perceived by a free-swimming tuna. After many weeks of training, a kawakawa has learned to discriminate between ambient water and water 1.5°C (2.7°F) warmer than ambient in order to receive a food reward. Further testing, with reduced temperature is now underway to determine the fish's threshold of temperature perception.

BAITFISH SAMPLES FROM JALUIT YIELD FIRST SARDINELLA SIRM IN ENTIRE TRUST TERRITORY COLLECTION

With the objective of determining the kinds and abundance of baitfish in the Trust Territory, sorting, measuring and sexing of baitfish samples were

continued at the Honolulu Laboratory. Sardinella sirm, widely distributed in the Indo-Pacific was found in the collection from Jaluit, the first appearance of this species in the entire Trust Territory collection. Reports from Majuro indicate that very few baitfish were observed in the lagoon because of bad weather.

INTERIM REPORT ON UPTAKE AND EXCRETION OF MERCURY BY SKIPJACK TUNA

At the request of the Tuna Research Foundation (TRF), a project to determine the uptake and excretion of mercury by live tunas was begun in June, 1972 by the La Jolla and Honolulu Laboratories. Although the chief interest of TRF was in the rates at which yellowfin tuna accumulate and excrete mercury, skipjack was studied instead because yellowfin are not available in numbers around the Hawaiian Islands where the experiments had to be performed, and skipjack are next in importance to the tuna fishing industry. About 200 skipjack, averaging 1.5 kg each were captured by hook and line after chumming in waters around Honolulu and put into live wells on the deck of the NMFS research vessel, Gilbert, and off-loaded directly into experimental tanks at the Kewalo Basin facility of the NMFS. Seven deep swimming pools containing approximately 30 fish each were used for experimental tanks.

The control diet for one group of fish was whitebait alone and others were fed whitebait with a gelatin capsule containing dried marlin which had a known high concentration of mercury. Preliminary results indicate that on a diet containing high mercury the increase in white muscle of skipjack was linear in each tank, increasing about 0.1 ppm in approximately 3 weeks. When high-mercury marlin was dropped from the diet, there was little or no drop in the mercury content of the white muscle.

It is planned to analyze all of the tissues and whole fish from the experiment just completed to draw up a complete mercury balance.

STUDY RELATES TYPES OF PLANKTON TOWS AND SUCCESSFUL SKIPJACK TUNA LARVAE CATCHES

Tuna larvae collected in plankton net tows Gilbert Cruises 113 and 114 and Cromwell Cruise 42 were identified to species, and records of skipjack larvae from these and other Honolulu Laboratory cruises were examined to determine the type of tow best suited for collecting skipjack tuna larvae. The results of simultaneous oblique closing net tows in Hawaiian and equatorial waters indicate that skipjack tuna larvae are concentrated within 60 m of the surface with a small percentage at greater depths, and that the proportion of successful tows differed with depth in the two areas. In Hawaiian waters, the proportions of successful tows in surface and 60-m oblique catches were similar (46% vs 59% on one cruise; 82% vs 86% on another), as were the successes in horizontal tows at depths of 0, 10, and 20 m (86%, 60%, and 100%, respectively). In equatorial waters the proportions of successes in surface and 140-m oblique tows differed greatly and nine tows each at depths of 0, 20, and 30 m showed greater successes with increasing depths. Objective of this research is to assess the abundance, distribution and area of spawning of important tuna species.

SUMMARY OF HAWAIIAN BAIT CATCH DATA REVEALS MORE RECENT EMPHASIS ON DAY BAITING

Honolulu Laboratory Biologist R. Uchida, summarized bait catch and skipjack catch data for May-September, 1965-71, as requested by Mr. Frank Goto of United Fishing Agency in Honolulu. In general, these data show that in 1965-67 more effort was expended in night baiting, while in 1968-71 emphasis shifted to day baiting. Over the years, catch per day fluctuated around an average of about 30 buckets and catch per night averaged around 10 buckets.

* * * * * * * *

Government of American Samoa employee, P. Niuatoa recorded the lengths of 2,065 albacore from 45 vessels at Samoa during the period September 23 to October 20, 1972. Forty-four sets of catch and effort data were collected. Data from 10 vessels were used to determine an average size of 91.2 cm and an albacore catch per 100 hooks of 4.25.

A typical longline vessel fishing for yellowfin tuna along the equator had the following catch rate: albacore, 0.48; bigeye tuna, 0.52; and yellowfin tuna, 2.72 per 100 hooks.

NMFS-CHARTERED TUNABOAT, INDEPENDENCE, RETURNS FROM PORPOISE RESEARCH CRUISE

The chartered tunaboat, Independence, returned to San Diego from a porpoise research cruise on October 29, 1972. The objectives of the cruise were 1) to inject tagged porpoise with lead acetate, a compound that is laid down as a discrete layer in hard tissues for subsequent ageing studies in recaptured animals, 2) to sex and measure large samples of porpoise, to determine age and sex structures of the populations, and 3) to observe

the differential behavior of tuna and porpoise in the net, to design better porpoise rescue gear. Bad weather (30 days out of 32) and problems with the sampling equipment hampered the work directed toward the first two objectives, but 61 animals were lead-tagged, and length/sex data were obtained for several hundred more. A great deal of observational and photographic information was collected on tuna and porpoise behavior in the net. Mr. R. McNeely of the Northwest Fisheries Center, Seattle, was the cruise leader. La Jolla Laboratory personnel on the cruise were Messrs. D. Holts, Fishery Technician and J. Coe, Biological Aid.

TUNA DATA MANAGEMENT SYSTEM PLANNED

A scheme for the development of a tuna data management system has been set out by D. Mackett, Fishery Biologist at the La Jolla Laboratory. Plans call for the evaluation of several generalized data base management systems currently available from commercial sources. At the same time the requirements for data and data processing of each SWFC project will be specified. The first major undertaking of the system development task will be the production of a report specifying the features of the candidate data management systems with comparisons of their performance in handling data retrieval jobs of varying difficulty or complexity.

POSSIBLE COOPERATIVE ALBACORE RESEARCH WITH JAPAN

Dr. M. Laurs of the La Jolla Laboratory returned October 16 from a 2-week trip to Japan where he was invited to present a paper concerning oceanographic data requirements of fishery scientists for forecasting at the World Meteorological Organization Conference in Tokyo. He spent several days at the Far Seas Fisheries Research Laboratory in Shimizu to become familiar with Japanese methods for collecting and processing catch and effort and size-frequency data for the Japanese fisheries on north Pacific albacore. Dr. Laurs also explored the possibilities for a Japanese scientist to work in La Jolla on Japanese albacore data in a cooperative study with SWFC fishery biologists on the population dynamics of the entire north Pacific albacore population.

CENTER DIRECTOR ATTENDS IOFC/IPFC MEETINGS IN SRI LANKA

Dr. Rothschild attended the Indian Ocean Fishery Commission meetings and the Indian Ocean Fishery Commission/Indo-Pacific Fisheries Council working group on tuna management meetings in Colombo, Sri Lanka October 5-13. He reports that with respect to the Indian Ocean Fisheries Program's work on skipjack tuna fisheries feasibility, the work has been temporarily deferred owing to intensive activities by Japanese firms in the region and pending UNDP/FAO projects in Sri Lanka, India, and Burma which will deal directly or in part with the development of skipjack fisheries. During the IOFC/IPFC meeting on tuna it was indicated that increased catches of skipjack were being taken from Sri Lanka and the Maldives. It was pointed out that three Japanese vessels are fishing skipjack in Madagascar this year; next year 10 vessels are expected. Increased skipjack fishing activities have been noted north of New Guinea and in the Papua region. The observer from the Soviet Union indicated his government's interest in tuna in this region.

TUNA PAPERS PREPARED FOR ICCAT MEETING

Drs. William Fox, William Lenarz, and Gary Sakagawa, worked at the La Jolla Laboratory on completing studies of minimum size and catch quota regulations for Atlantic yellowfin tuna and minimum size regulations for Atlantic bluefin tuna, as well as review papers of these two fisheries, preparatory to the upcoming meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) in Madrid, Spain, in November.

* * * * * * * *

NMFS Technician, Dana Grebbien, has returned to the La Jolla Laboratory from West African waters where he was an observer aboard the U.S. purse seiner, Aries; Marvin Snell is aboard the seiner, Caribbean which was slated to begin fishing in African waters at the end of October. Dave Zantiny is aboard the seiner, Gemini, which is fishing in the Pacific. Mission of the observer is to collect data on the size distribution of Atlantic yellowfin tuna in single sets.

CENTER DIRECTOR ATTENDS SECRETARY PETERSON'S PRESS CONFERENCE ON MARINE MAMMALS

Dr. Rothschild attended the press conference held by Commerce Secretary Peter G. Peterson at Marineland, California, October 18, at which the Secretary issued the report of a committee headed by Dr. D. Alverson, Director of the NMFS Northwest Fisheries Center. Dr. W. Fox and Mr. W. Perrin, at the La Jolla Laboratory, were members of Dr. Alverson's committee. The report recommended an intensive effort to save porpoises from accidental death in the nets of the U.S. tuna fleet. Among the Committee recommendations endorsed by the Secretary were that all tuna seiners

be encouraged to use the Medina net panel which makes it more difficult for porpoises to become entangled; a cooperative Federal-industry program be launched to teach tuna fishermen to use more efficiently "backing-down" techniques, allowing porpoises to escape over nets; a program be undertaken to improve fishing techniques and gear; population assessments of porpoises be undertaken; and an investigation be made of the reaction of porpoises and tuna to artificially-induced stimuli. Secretary Peterson said the Committee believes short-range solutions can best be attained by modifying existing techniques, perhaps by using a deeper-Medina panel, by changing backing-down tactics, by developing a dual purseline seine, and by developing net "sorting panels." Steps are underway at the SWFC's La Jolla Laboratory to implement portions of the committee's recommendations.

TRANSLATIONS

The Southwest Fisheries Center is undertaking the translation of important French papers on tuna. Dr. W. Lenarz of the La Jolla Laboratory is presently editing the English versions and abstracts of the papers will be presented in subsequent editions of the Tuna Newsletter. At that time, copies will be made available to anyone interested.

Albacore Landings for 1972 Season

STAFF, Fishery-Oceanography Investigations; R. MICHAEL LAURS, Leader

Preliminary west coast landings for the 1972 albacore season are about 68 million pounds (34,000 tons). This is the second highest total catch in 32 years and the best since 1950. It is also 26% larger than the 1971 total catch and 36% above the 1962-71 average of 50 million pounds (25,000 tons).

The preliminary California landings for 1972 are 23.0 million pounds, down about 36% from those in 1971. The aggregate Oregon, Washington and British Columbia landings are 44.6 million pounds, up about 91% of those in 1971. The landings in Washington and British Columbia are also the highest on record.

The preliminary landings by state for 1969-72 are:

	1972	1971	1970	1969
California	23.0	36.1	29.9	14.7
Oregon	21.2	8.4	21.8	29.8
Washington	15.8	5.3	4.3	3.5
British Columbia	7.6	3.7	1.6	2.5

Highlights of the 1972 Albacore Season

The 1972 albacore season was highlighted by the American Fishermen's Research Foundation (AFRF) - National Marine Fisheries Service's (NMFS) pre-season scouting and research program, early price settlement, excellent catches off British Columbia which accounted for much of the record landings in Washington and British Columbia, and one of the highest west coast landings on record.

Beginning in late May, the AFRF with the cooperation of the NMFS sent 12 jigboats and the R/V Townsend Cromwell to offshore areas of the North American west coast to do oceanographic, scouting and tagging work in relation to large-scale migration of albacore into the west coast fishery. The R/V Townsend Cromwell did oceanographic and environmental studies in an area from 31° to 41°N latitude and 135° to 140°W longitude during most of June, while the 12 jig-boats were scouting and tagging albacore. The jigboats worked in three groups of four vessels each out to 140°W longitude and from Guadalupe Island to northern California from late May to early June and off Oregon and Washington from mid-June to mid-July (four boats only). The Oregon Fish Commission and Oregon State University were also doing tagging and oceanographic studies off Oregon in July.

The first catch of the season was reported by one of the chartered boats on May 30 about 100 miles southwest of Erben Bank. A few 100 fish/day scores were made by some of the jigboats in this area in June.

The AFRF also chartered a baitboat which tagged 526 albacore in nearshore areas from central to Baja California in July and August and worked with the R/V David Starr Jordan on sonic tagging studies off Monterey and Morro Bay in August. The total number of tagged and released albacore is 2842, with 1425 fish tagged by 12 jigboats this year and 891 tagged by four boats in October 1971. To date 86 tags have been returned.

The albacore price settlement was reached on June 5 at $680/ton delivered to the canneries. All stipulations were similar to the 1971 contract except that the canneries would pay the above price for all albacore landed this season. Although the contract was reached earlier than in 1971, only a few boats were fishing by the end of June. Catches were best near Erben Bank and scattered from west of Point Arena to 100 miles southwest of San Diego during June.

As in 1971 most of the commercial boats began fishing after July 4. During early July much of the fishing was centered off San Juan Seamount to Morro Bay and Coos Bay, Oregon with some good catches off the Columbia River, Baja California and Cape Mendocino. By the end of the month, however, consistent good catches were being made between Cape Blanco and Tillamook Head with scattered good scores off California

and Cape Cook to Grays Harbor. Fish off Baja California were already reported to be running deep, while poor weather was a factor that hampered fishing off central California in late July.

Better scores continued to be reported from Coos Bay, Oregon to Cape St. James, Queen Charlotte Islands in August. The majority of the albacore fleet moved northward during this month with increasing catches from Newport, Oregon to Cape St. James. From early August to mid-September boats between Cape Scott, Vancouver Island and Cape St. James had some of the best fishing ever for jigboats. Boats were regularly getting albacore averaging about 20 pounds, and scores were better than 75 fish/jigboat/day and up to 400 fish/boat/day. Baitboats were also getting good scores from the Columbia River northward during this period. Good catches were more scattered between Westport, Washington and Coos Bay and central California. At the end of August, some of the smaller boats began to leave the Pacific Northwest anticipating poor weather and expecting better fishing off central California during September.

September scores were good between Cape St. James and Cape Scott and off Destruction Island when weather permitted. However, because of increasing rough seas, most of the jigboats left the Canadian waters by mid-September. A few baitboats were also fishing between Cape Flattery and Westport with some success. In other areas of Washington and Oregon, jig- and baitboats caught fish only in patches. As fishing decreased in the Pacific Northwest, more effort was expended between Point Arena and Morro Bay. Although many schooled and jumping albacore were seen in the area - as they had been throughout the season - catches were generally small for jigboats and spotty for baitboats.

Many boats were tying up for the season in October. The fishery was mainly off central California with some boats working off Destruction Island during this month. By November only a few commercial boats were fishing for albacore.

The first albacore caught by San Diego sport boats was on June 23. From late June to mid-October sport catches were inconsistent on large fish. Purse seiners were also able to get large fish on a few days in August and September.

Albacore caught this year appear to be larger than those caught in previous years. Many of the catches off Baja California and north of Cape Flattery were on fish averaging 20 pounds or better.

Subsurface Temperature Structure in the Northeast Pacific Ocean

J. F. T. SAUR

Only one section of subsurface temperatures between San Francisco and Hawaii is available for November 1972. It was made from observations taken by the Chevron California during the period November 20-24, 1972 (Figure 10). Observational coverage begins about 250 nautical miles from the California Coast.

During the 5-week period since the section of October 14-17, the surface mixed layer has deepened to a nearly uniform 60-80 meters across the entire section. Although some loss of heat to the atmosphere occurred at the surface, the downward movement of heat by mixing due to strong winds was a major factor in deepening the mixed layer. As a result of these processes, the near-surface temperatures dropped about 2° to 3°C (4° to 6°F). At the same time temperatures at approximately 60 m have warmed 1° to 3°C (2° to 6°F) and waters at this depth now lie within the mixed layer. When deepening by wind mixing occurs the thermocline just below the mixed layer generally becomes quite sharp as can be noted in the selected station profiles in Figure 10.

As in October, no distinctive transition zone or boundary between the eastern North Pacific Central Water and the California Current waters can be identified, especially lacking the surface salinity data. A generally downward slope of the thermocline (15° to 12°C isotherms) occurs from observation 1 out to observation 11 (nearly 1100 miles from the coast) indicating a broad southeastward flow across the section. An exception to this is the rise in the isotherms at observations 8, 9, and 10 which lie in the region where surface salinities last month indicated the presence of transition zone. Beyond 1100 nautical miles the isotherms show no general upward or downward trend, so there is little flow normal to the section in that region.

Sea Surface Temperature and Environmental Conditions

L. EBER AND F. MILLER

Northeastern Pacific

Surface waters in the central part of the eastern North Pacific Ocean remained warmer than normal in November 1972 (Figure 5). Temperatures also remained above normal along the California and Baja California coasts, and in the offshore area southwest of Baja California. Coastal temperatures north of latitude 40°N continued to be below normal, but to a lesser degree than in the previous month. Offshore, the area of negative deviations spread southward to 30°N and westward to 135°W.

The eastern North Pacific High was located south of 40°N most of the month. During the 2nd and 3rd weeks of November many migratory Lows matured off the coasts of the U.S. and Canada, between 125°W and 140°W. The cyclonic flow associated with these lows resulted in moist southerly winds off Oregon and Washington, which retarded seasonal cooling through reduced evaporation and reduced transport of cold water southward. The maximum cooling from October to November occurred west of 140°W, between latitudes 40°N and 45°N, where northerly winds contributed to lowering temperatures through increased evaporation and advection of cold water southward. The area around the Aleutian Islands also was the scene of vigorous cyclonic activity in this period. Northerly winds in the western sectors of the Lows caused increased cooling of sea temperatures west of 175°W, mostly between latitudes 40°N and 45°N. Reduced cooling took place in the vicinity of longitude 165°W, under the influence of southerly winds in the eastern sectors of the Lows.

In the last 10 days of November, the eastern North Pacific High shifted eastward and stabilized in the vicinity of 133°W. During this period, several Lows developed north of the Hawaiian Islands between

30°N and 45°N. Associated northerly winds in the area from 160°W to 165°W, and southerly winds between 145°W and 155°W caused further variances from the normal cooling pattern.

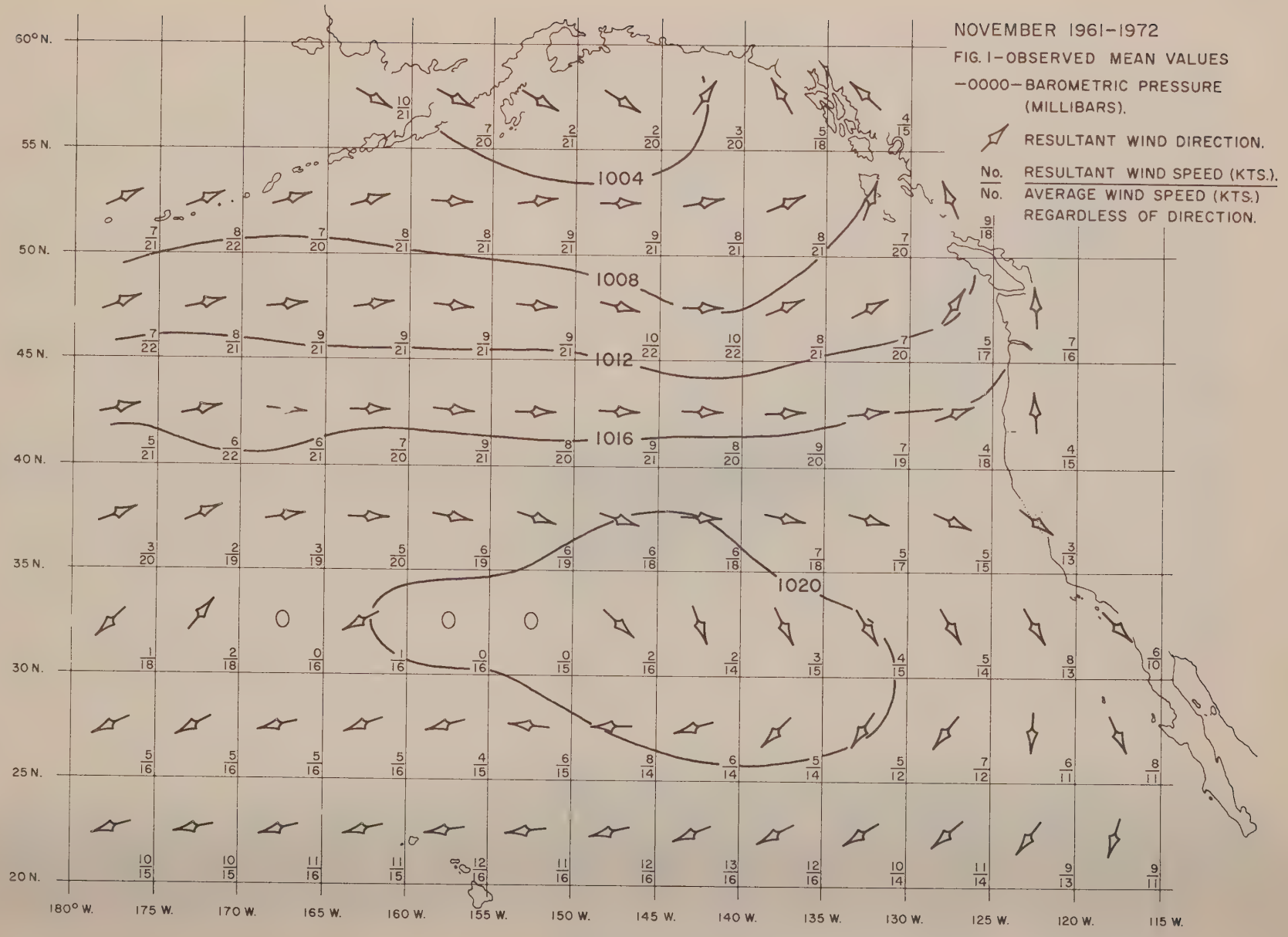
These meteorological disturbances appeared to have a minor effect on anomalous sea temperature conditions and are, themselves, barely discernable in the monthly mean chart (Figure 2). Events in the first 3 weeks seemed to portend a change of the large-scale circulation regime, but were largely neutralized by subsequent conditions. Comparison with 1971 (Figure 6) shows a considerable difference in longitudinal temperature distribution which reflects an eastward displacement of warm temperature conditions in November 1972 relative to those which occurred in November 1971 and persisted into the following spring.

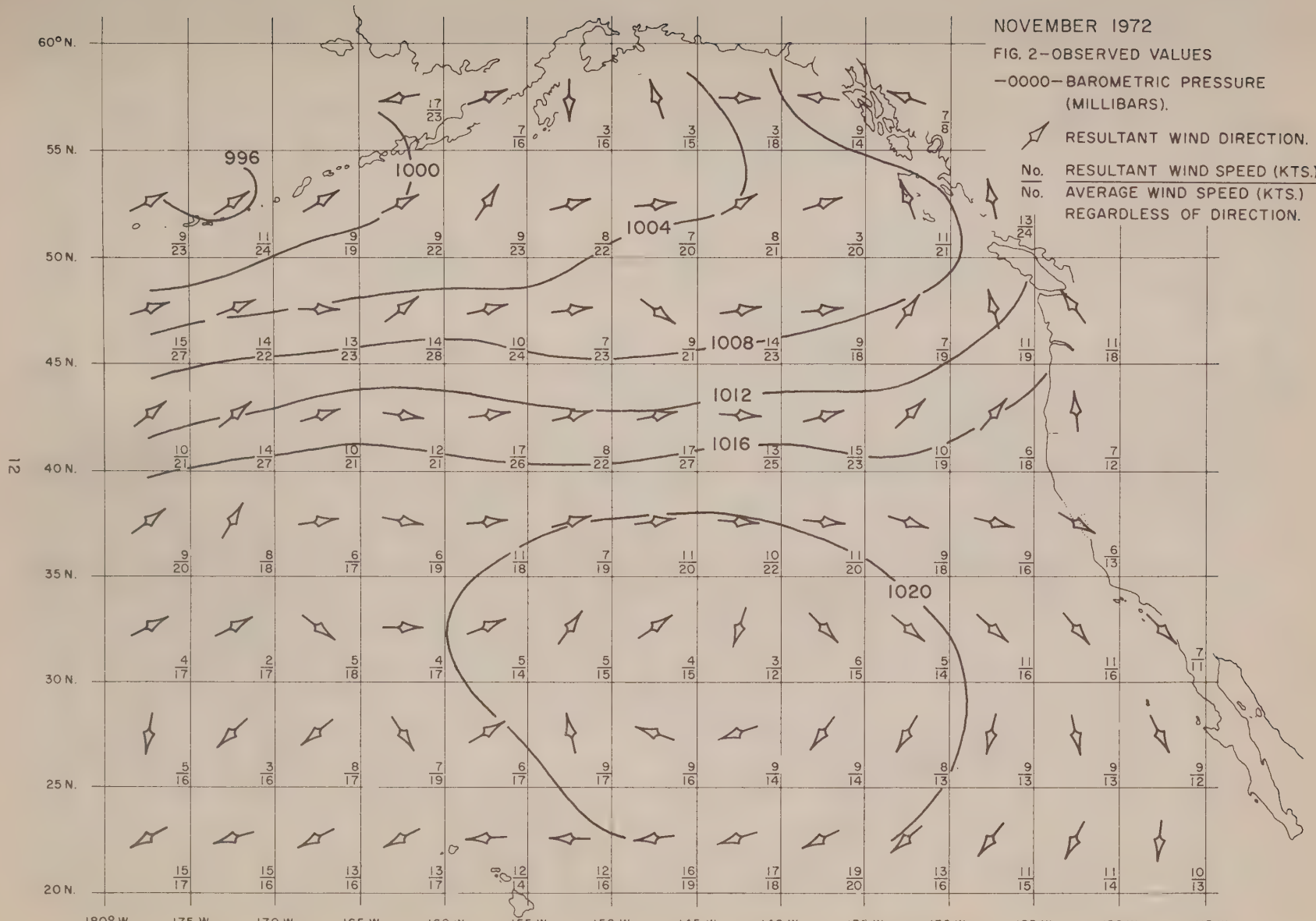
Eastern Tropical Pacific

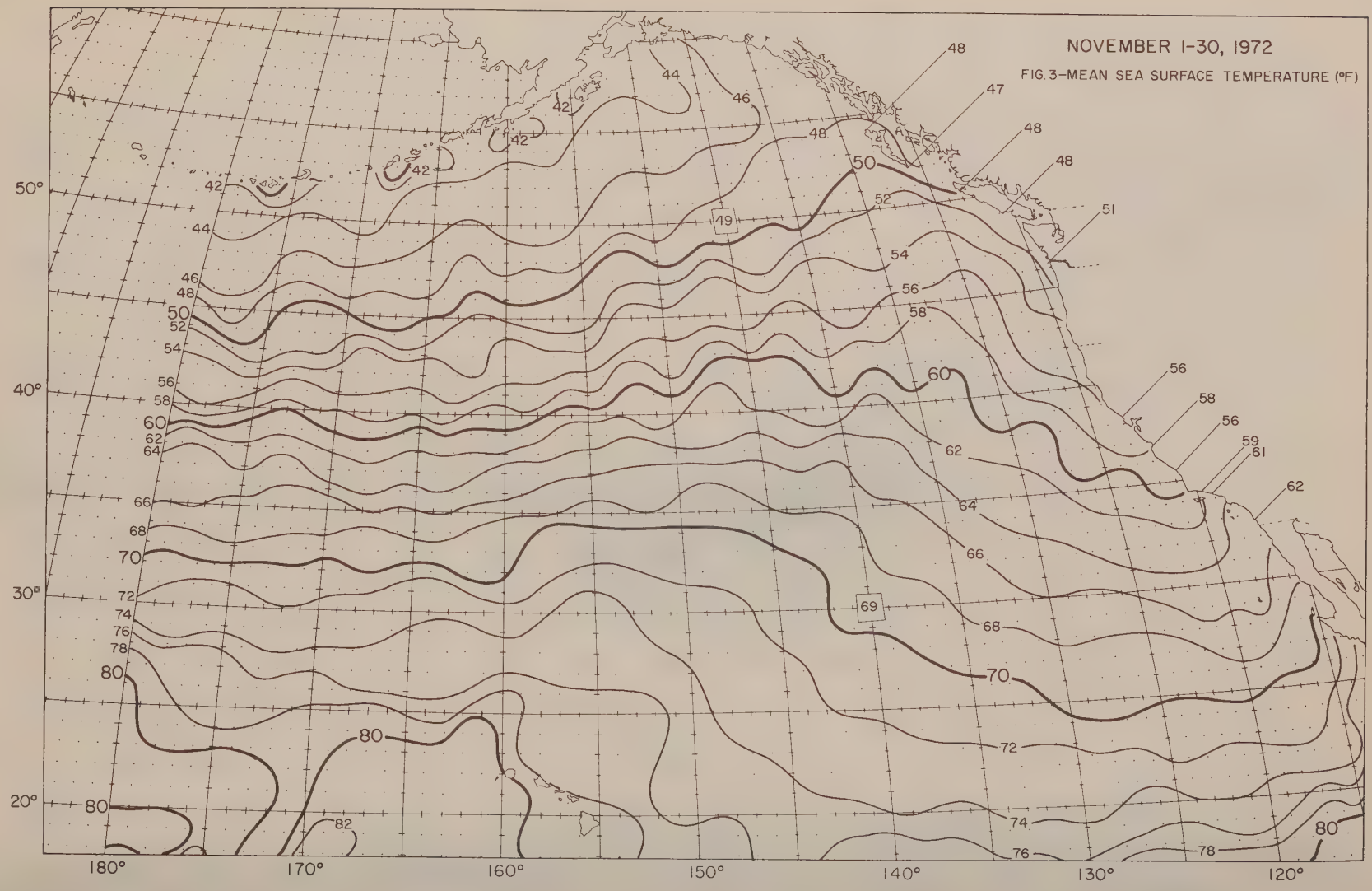
Sea surface temperatures remained above normal over most of the eastern tropical Pacific with anomaly patterns nearly unchanged from October (Figure 8). Warm anomalies of 2° to 4°F (1° to 2°C) extended westward along the equator to the International Date Line. Some cooling took place southwest of Baja California as a result of increased cloud cover and stronger surface winds.

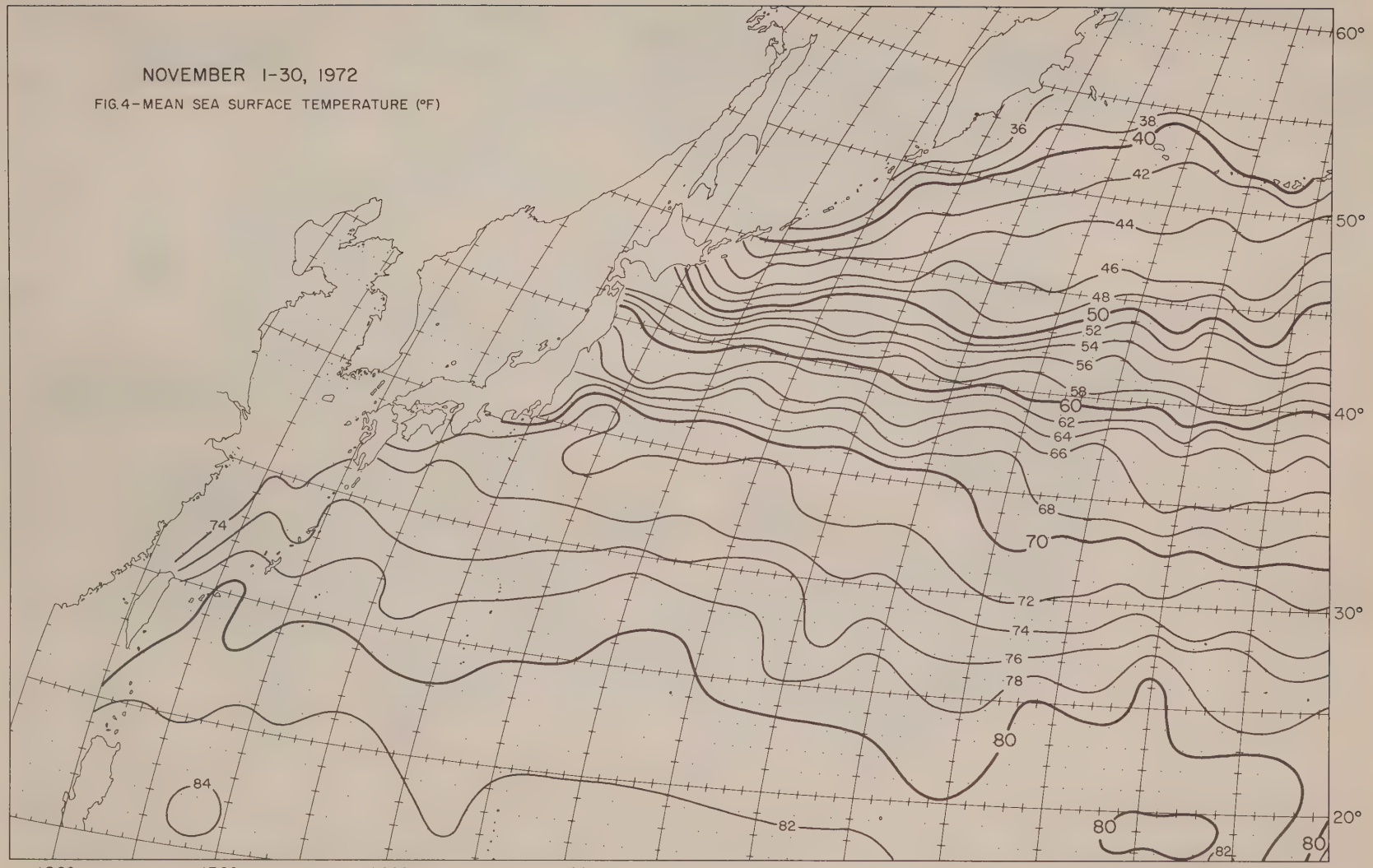
El Niño conditions prevailed along the coast of Ecuador and northern Peru. However, south of about 7°S sea surface temperatures were slightly colder than normal indicating that the southeast trades and upwelling were being reestablished. Because the warm water conditions off the coast of South America have been similar in 1972 to those during the 1957-58 El Niño, a brief synopsis of this year's events is given below.

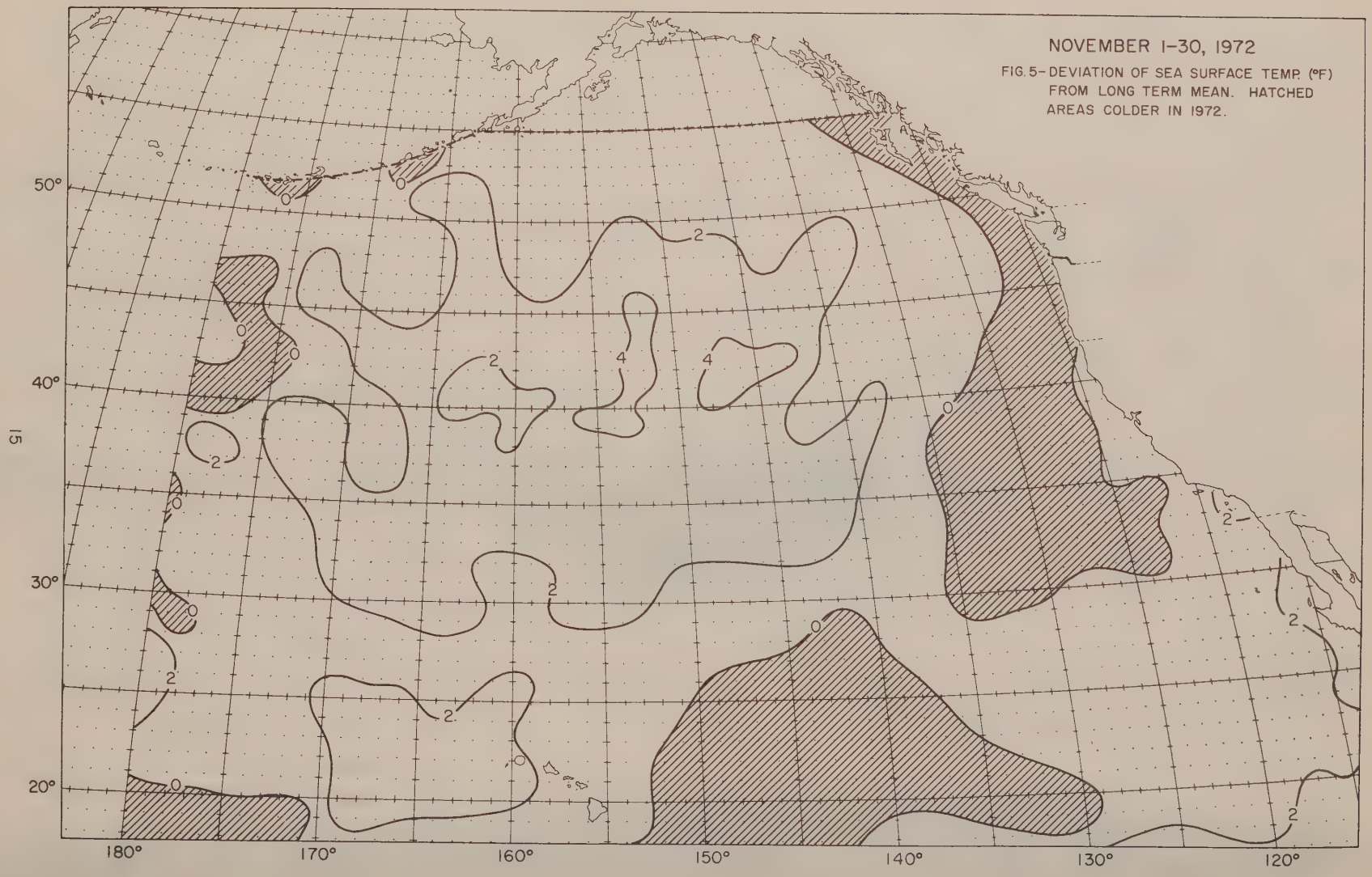
Beginning in February 1972 the expected seasonal cooling failed to develop in the Peru Current and along the equator. By July tropical coastal and island stations and ships crossing the equator recorded surface temperatures which were 3° to 4°C (6° to 8°F) above the long-term mean (normal). The unusually high anomalies spread out over most of the eastern tropical Pacific and into the central tropical Pacific by September. During October South American coastal stations south of 10°S were reporting a return of colder surface temperatures, indicating a return of upwelling to Chile and southern Peru. However, northern Peru and Ecuador continued to experience very warm water along the coast and westward to the Galapagos. Fishing in these waters had been poor most of the year and the anchovy fishing was curtailed off Peru in September. Conditions in November remained nearly the same as in October over the eastern tropical Pacific with an indication that the positive temperature anomaly may increase in December at South American Coastal stations north of 7°S. To the south of this latitude surface temperatures should remain slightly below normal.

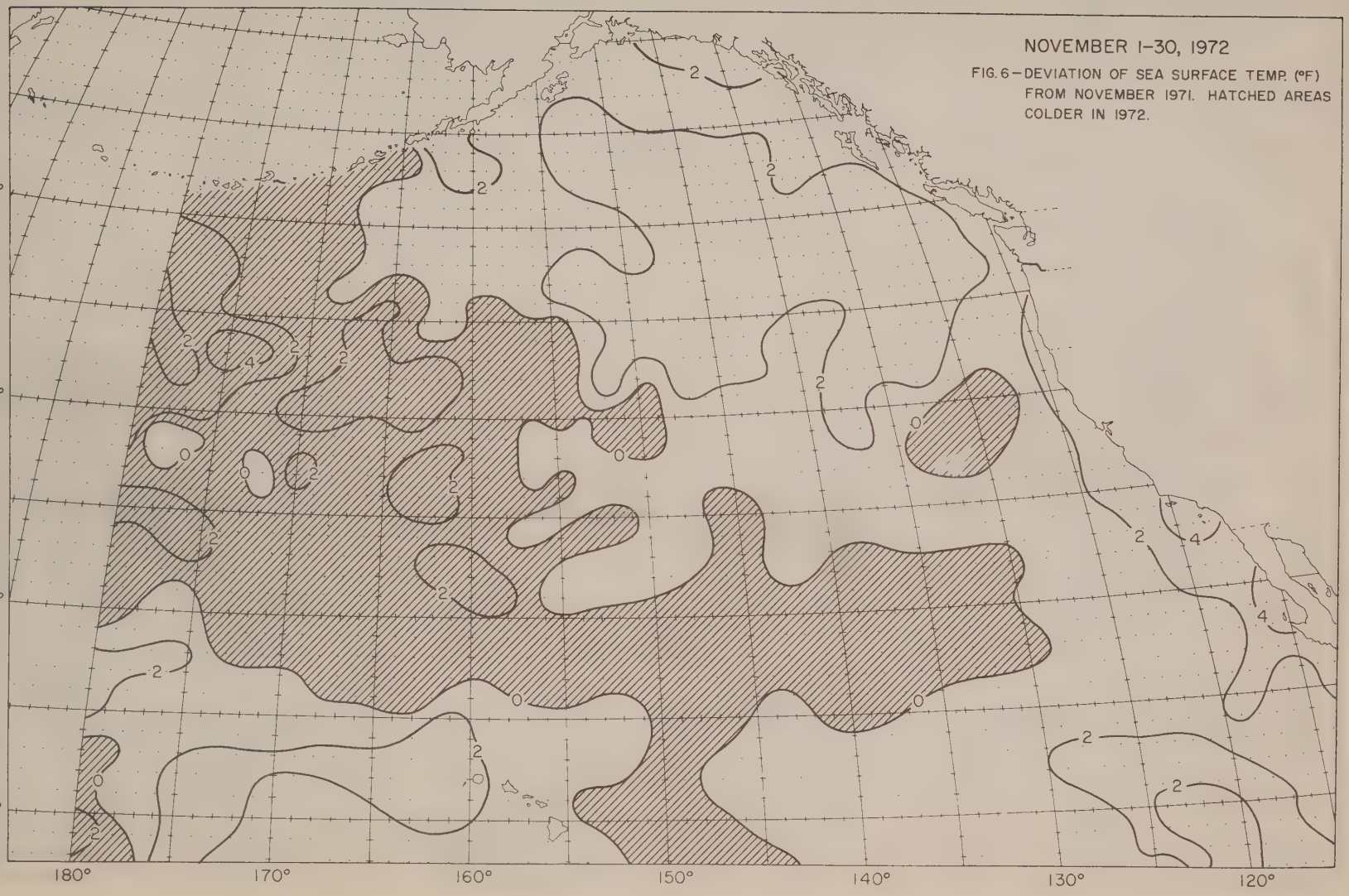

NOVEMBER 1961-1972
FIG. 1-OBSERVED MEAN VALUES
-0000- BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

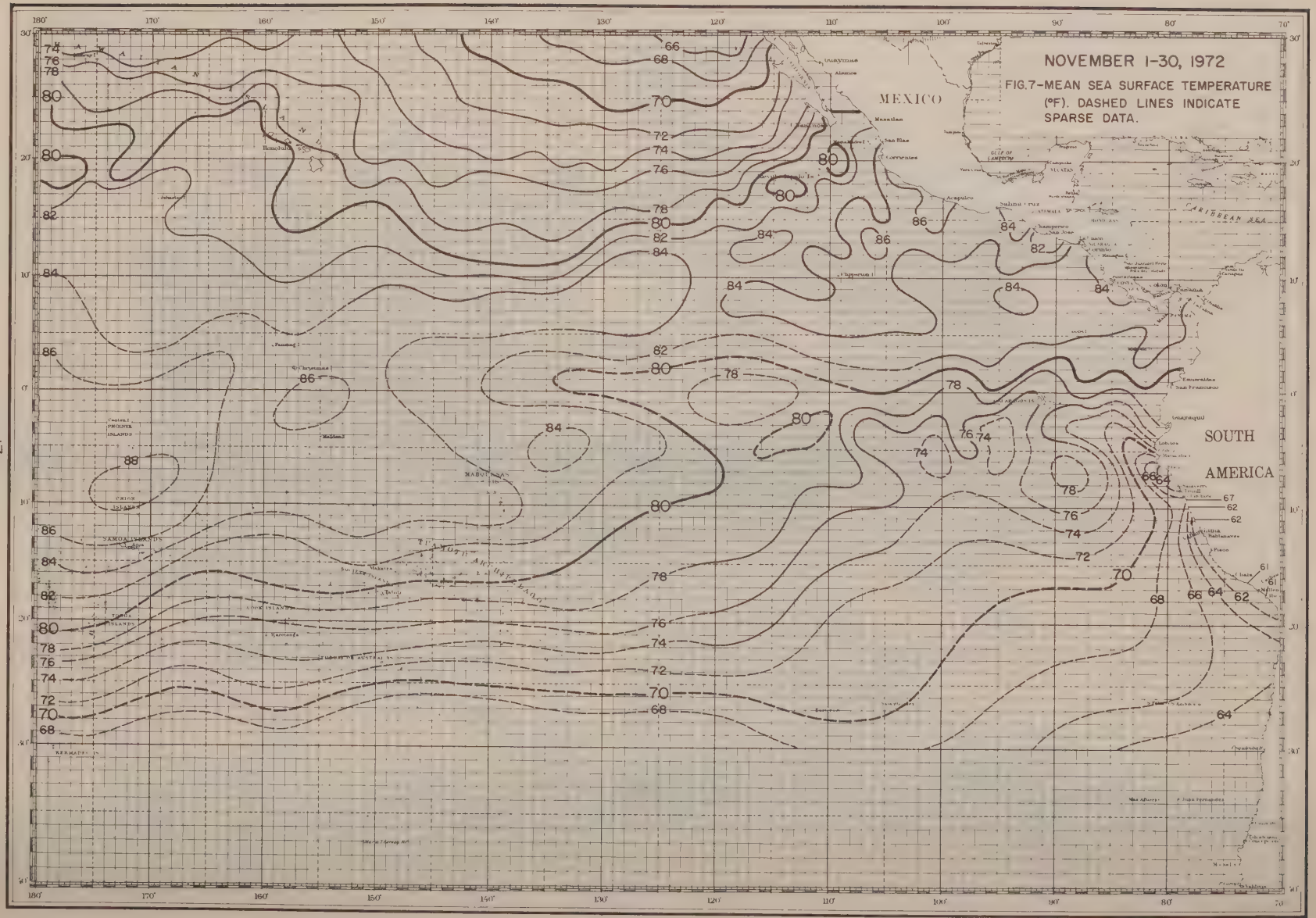

NOVEMBER 1972
FIG. 2-OBSERVED VALUES
-0000-BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
996
1000
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

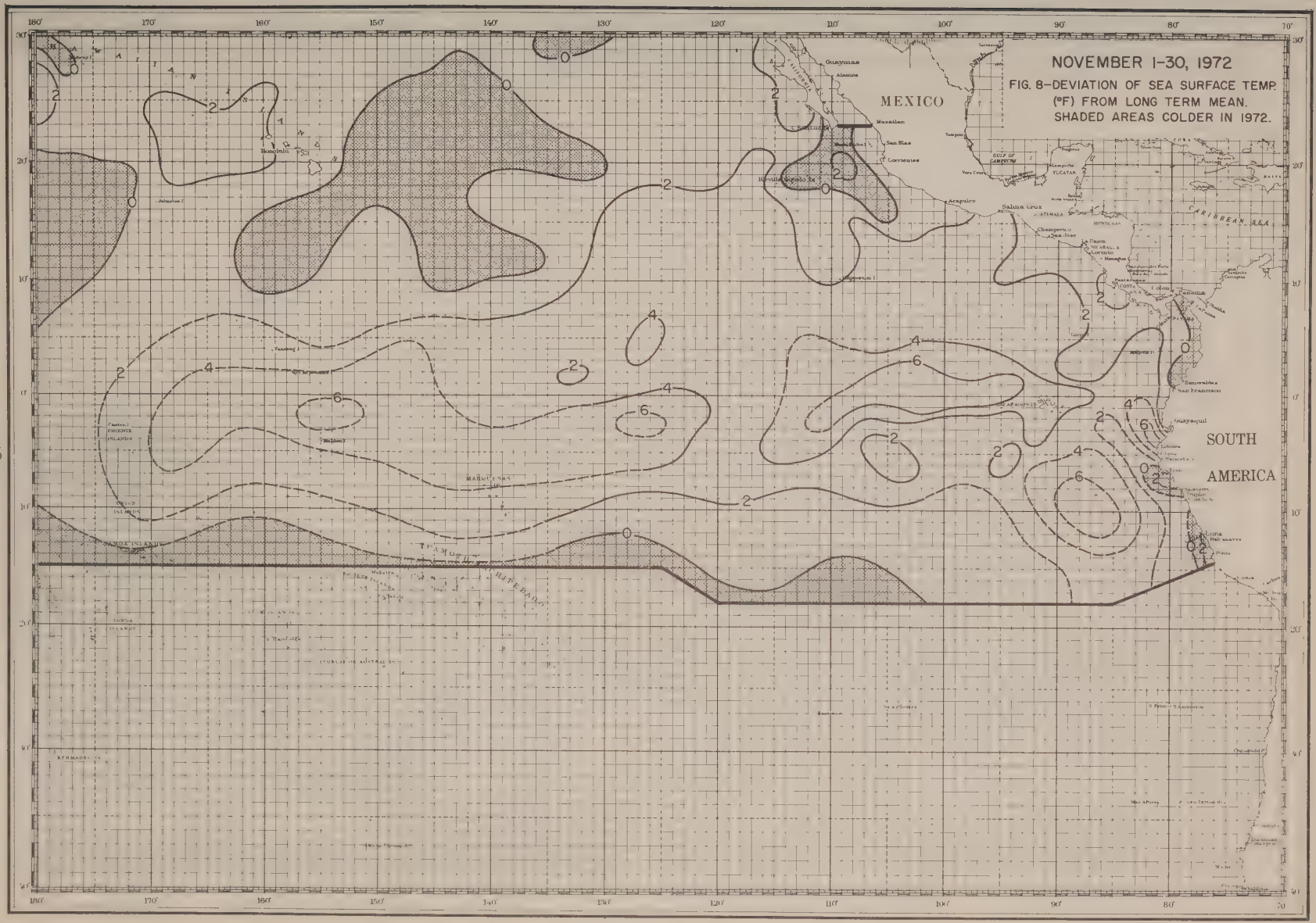

NOVEMBER 1-30, 1972
FIG. 3-MEAN SEA SURFACE TEMPERATURE (°F)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

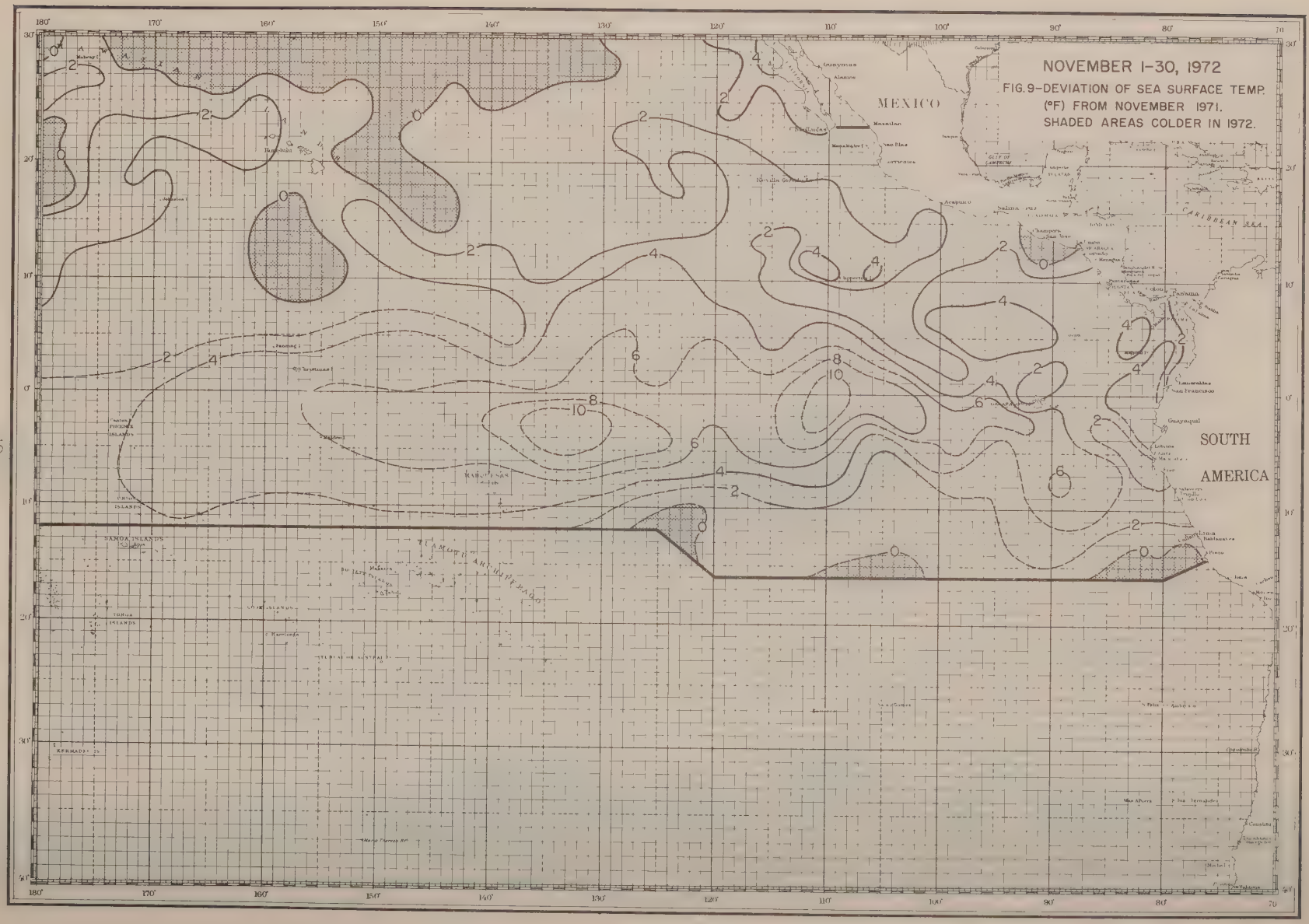

NOVEMBER 1-30, 1972
FIG.4-MEAN SEA SURFACE TEMPERATURE (°F)
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
74
80
82
80
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


NOVEMBER 1–30, 1972
FIG. 5– DEVIATION OF SEA SURFACE TEMP. (°F) FROM LONG TERM MEAN. HATCHED AREAS COLDER IN 1972.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
4


NOVEMBER 1-30, 1972
FIG. 6 – DEVIATION OF SEA SURFACE TEMP. (°F) FROM NOVEMBER 1971. HATCHED AREAS COLDER IN 1972.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

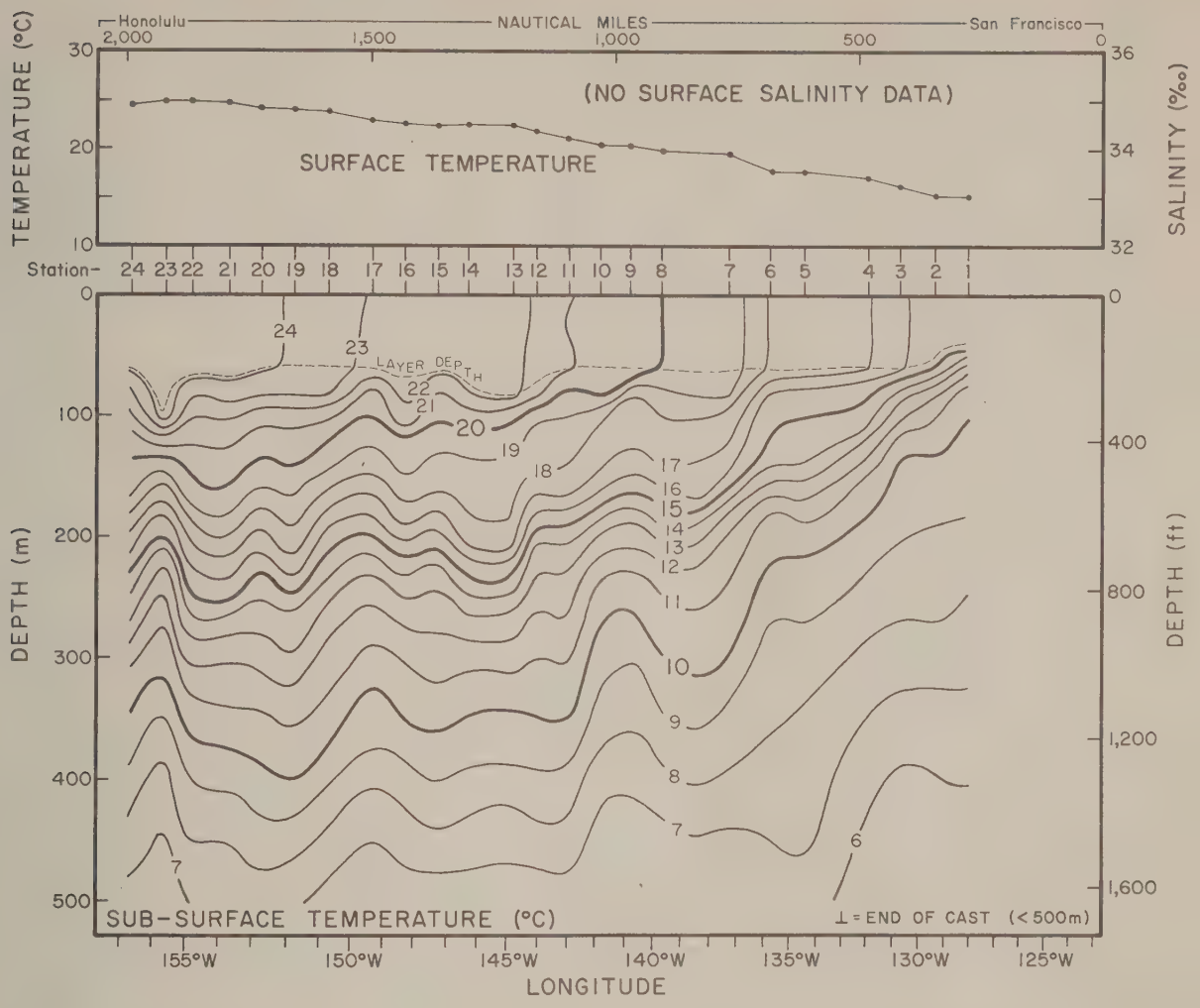

NOVEMBER 1-30, 1972
FIG.7-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF MEXICO
YUCATAN
Honolulu
Acapulco
Manzanillo
San Blas
Guayaquil
Galapagos Is.
Easter I.
Pitcairn I.
Tuamotu Archipelago
Samoa Islands
Union Islands
Phoenix Islands
Line Islands
Marquesas
Tubuai Islands
Austral Is.
Kermadec Is.
Juan Fernandez Is.
Tristan da Cunha
Gough I.
Mocha I.
Valparaiso
Callao
Chimbote
Salinas
Puerto Vallarta
Manzanillo
Zihuatanejo
Tehuantepec
Trinidad
Tobago
Barbados
Curacao
Aruba
Margarita
Cumana
Maracaibo
Puerto Cabello
La Guaira
Barranquilla
Cartagena
Colon
Panama
Puntarenas
Limon
Corinto
Acajutla
La Libertad
Salina Cruz
Champerico
San Jose
Esmeraldas
San Francisco
Tumaco
Buenaventura
Malpelo I.
Cocos I.
Galapagos Is.
Clipperton I.
Socorro I.
Revillagigedo Is.
Guadalupe I.
Cedros I.
Isla Natividad
Punta Eugenia
Magdalena Bay
Cabo San Lucas
Isla Cerralvo
Guaymas
Topolobampo
Mazatlan
San Blas
Tepic
Manzanillo
Acapulco
Salina Cruz
Champerico
San Jose
Corinto
Puntarenas
Limon
Colon
Panama
Cartagena
Barranquilla
Maracaibo
Puerto Cabello
La Guaira
Curacao
Aruba
Trinidad
Tobago
Barbados
Margarita
Cumana
Guayaquil

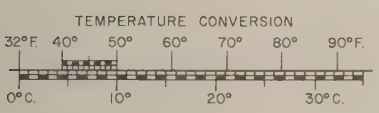

NOVEMBER 1-30, 1972
FIG. 8-DEVIATION OF SEA SURFACE TEMP. (°F) FROM LONG TERM MEAN. SHADED AREAS COLDER IN 1972.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
HAWAIIAN ISLANDS
PHOENIX ISLANDS
MARQUESAS
TUAMOTU ARCHIPELAGO
TONGA ISLANDS
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°

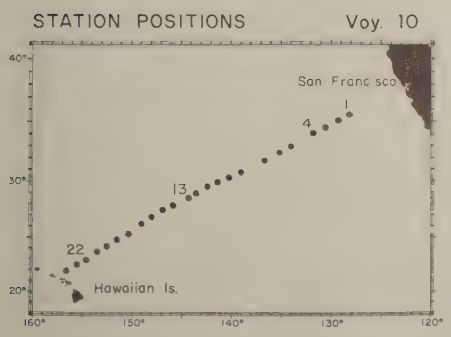

NOVEMBER 1-30, 1972
FIG. 9-DEVIATION OF SEA SURFACE TEMP. (°F) FROM NOVEMBER 1971. SHADED AREAS COLDER IN 1972.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF CALIFORNIA
PHOENIX ISLANDS
SAMOA ISLANDS
TONGA ISLANDS
KERMADEC IS.
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°

NOVEMBER 20-24, 1972
SS CHEVRON CALIFORNIA, Voyage 10

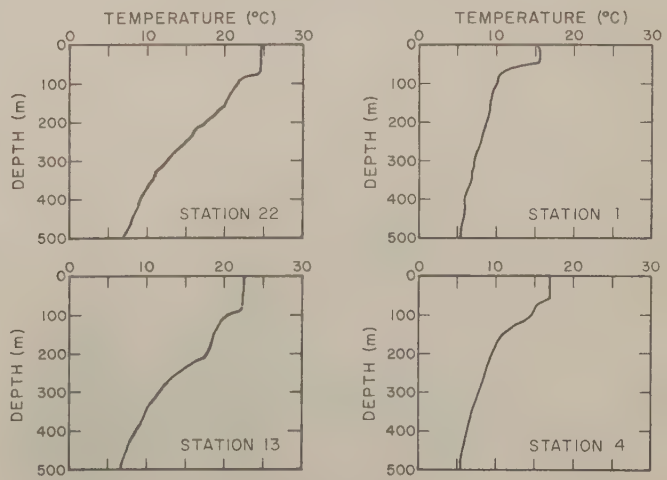
FIGURE 10.



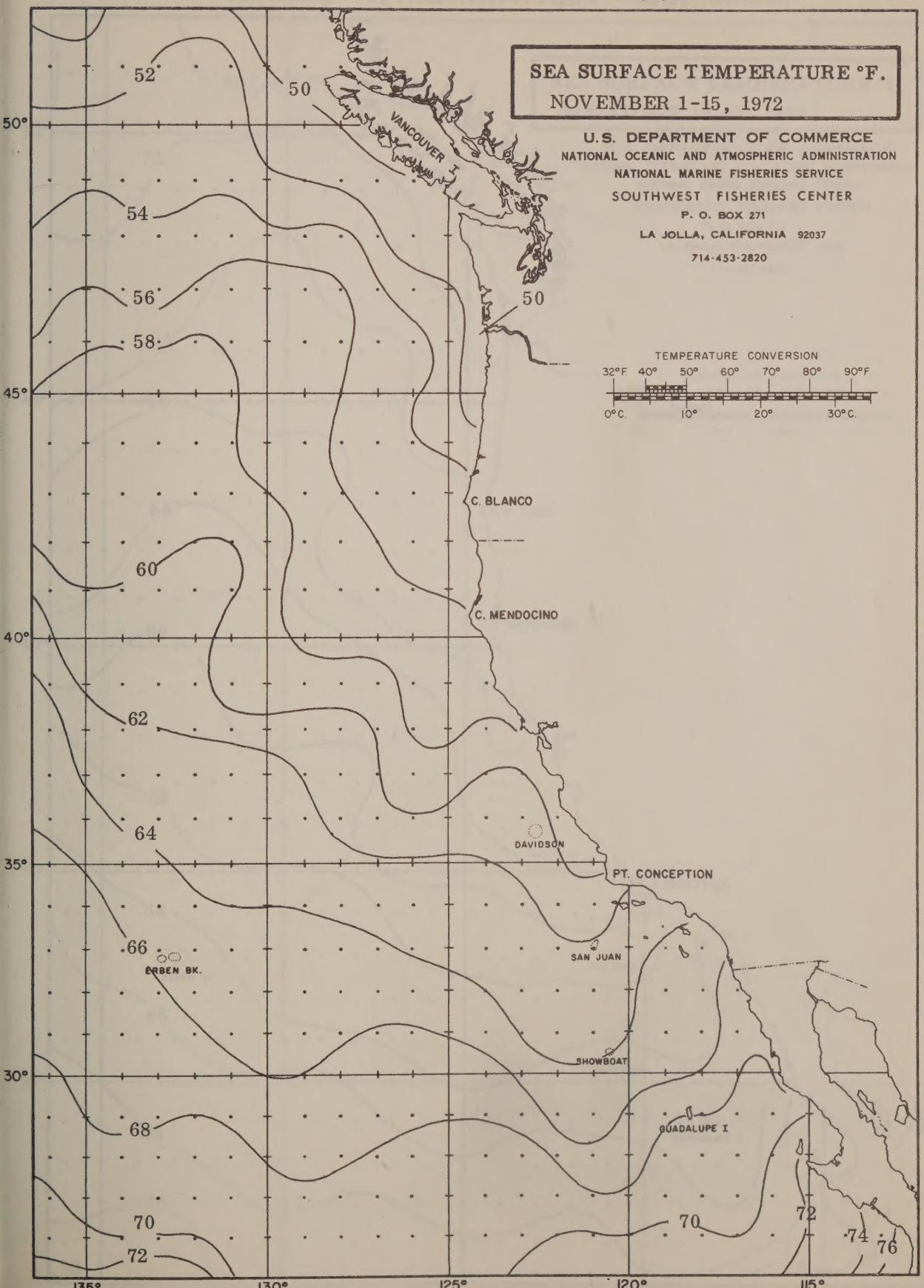


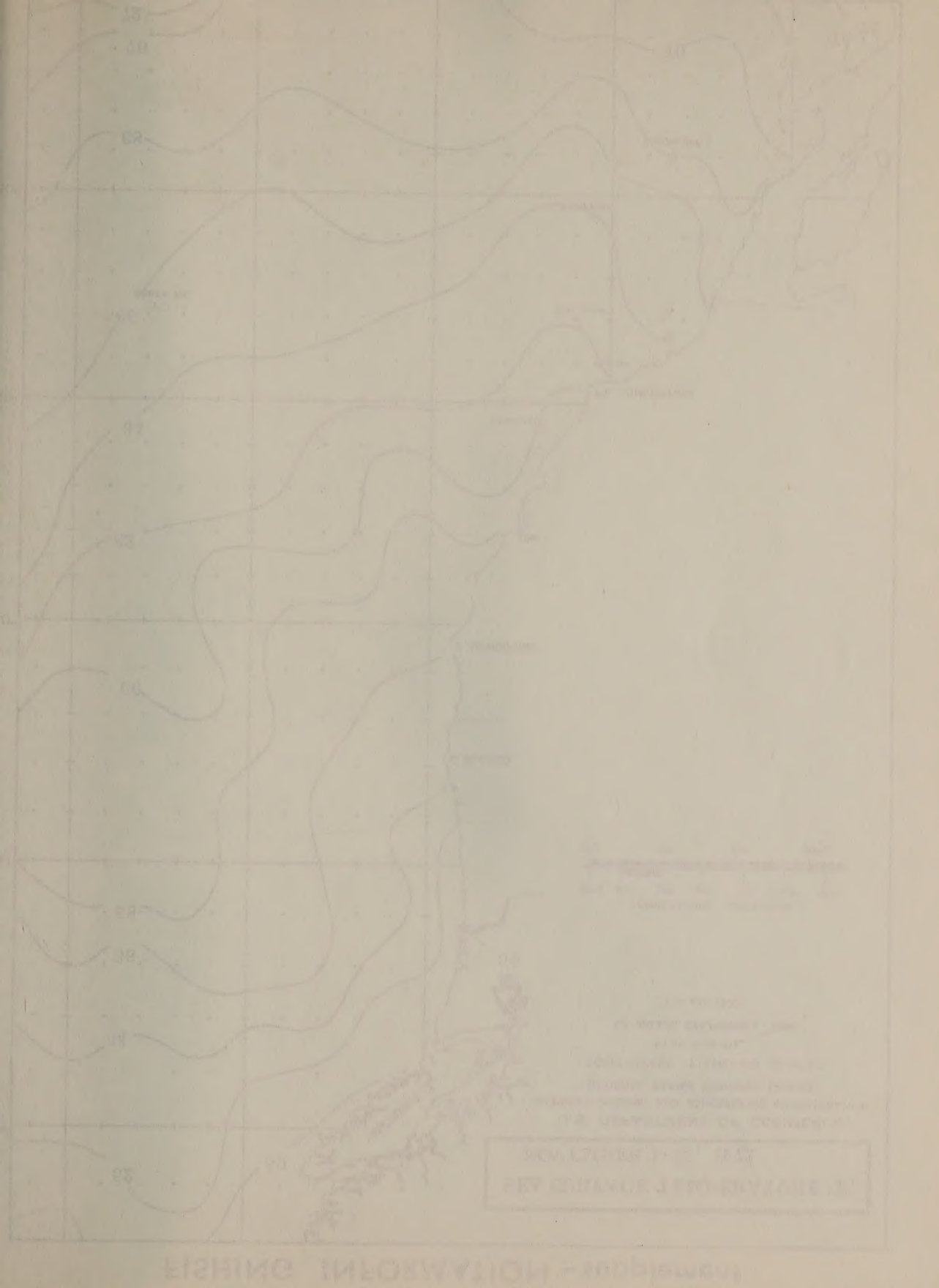


SELECTED STATION PROFILES



FISHING INFORMATION – supplement





FISHING INFORMATION – supplement